No. 675,056. Patented May 28, 1901.

T. A. EDISON.

MAGNETIC SEPARATOR.

(Application filed June 12, 1897.)

(No Model.)

Fig. 1.

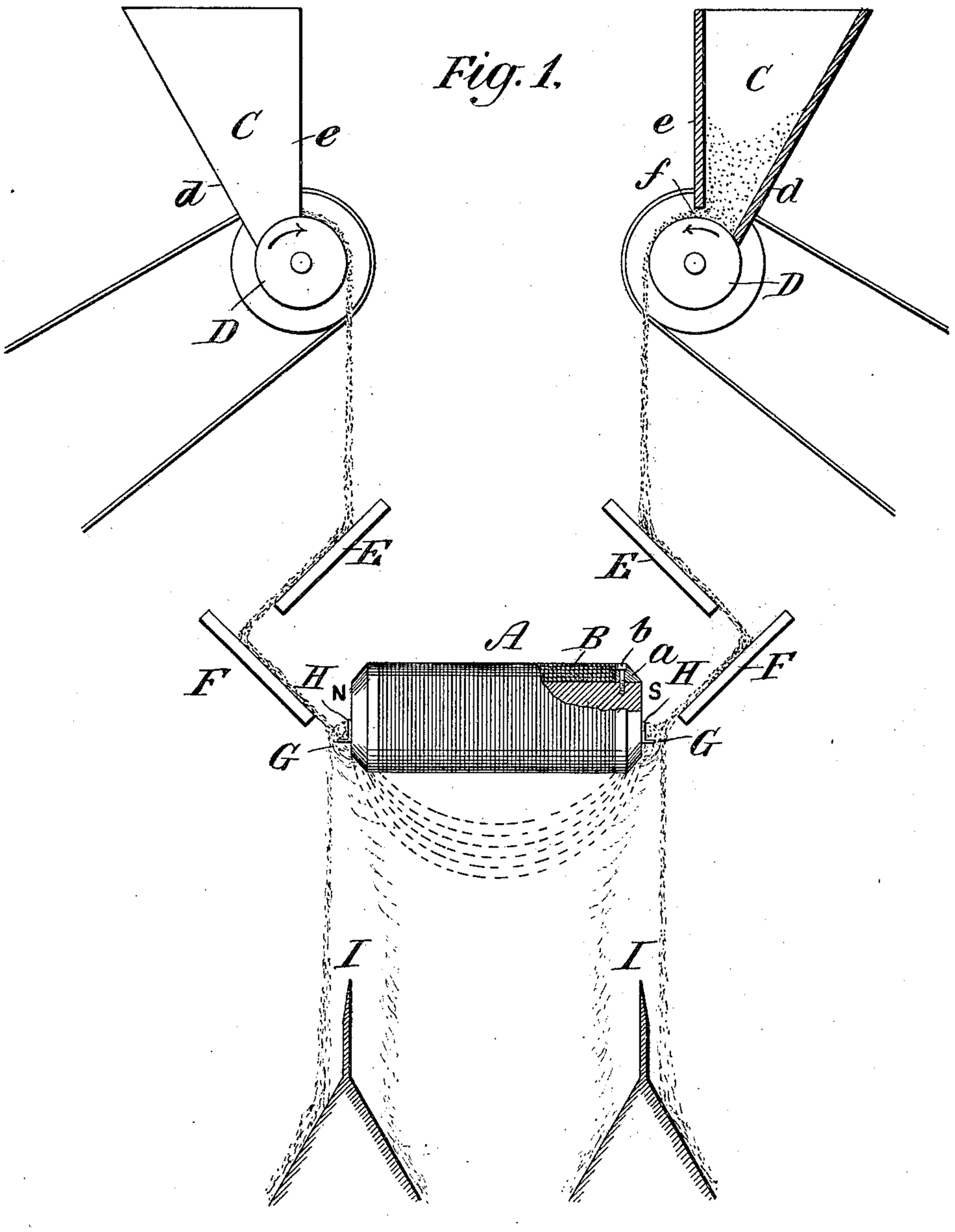
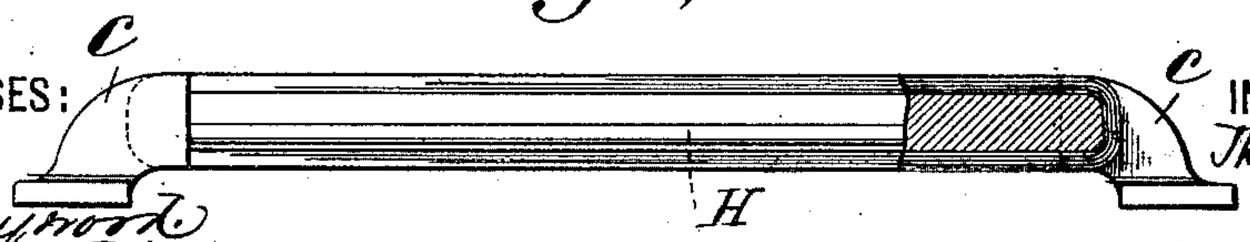


Fig. 2.



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MAGNETIC SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 675,056, dated May 28, 1901.

Application filed June 12, 1897. Serial No. 640,418. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Magnetic Separators, (Case No. 973,) of which the following is a specification.

The object I have in view is to produce a separator for ground material containing magnetic and non-magnetic particles particularly adapted for the separation of ground magnetic iron ore, which separator will be simple in construction and effective in operation.

In the accompanying drawings, forming a part hereof, Figure 1 is a view, partly in diagram, of apparatus embodying my present invention; and Fig. 2 is an elevation and partial section of the magnet employed in the apparatus looking at one of the polar faces.

A is a bar-magnet having an iron core N S, which has a minimum length between the poles and a maximum length at right angles to a line connecting the poles. For illustration of the proper proportions for this magnet-core I may say that I have found it desirable in practice to use as a core a soft-iron bar having a length of four feet six inches, a width of one foot, and a thickness of three inches. The magnetizing-coil B is wound lengthwise over the ends of this bar and over the flat side faces, leaving exposed for the polar faces the side edges of the bar. The coil B is maintained in place by strips of wood *a*, which are secured to the magnet-core by screws *b*. This magnet is arranged with its greatest length in a horizontal plane, and it is supported by legs *c* on suitable beams or blocks. (Not shown.)

C is a hopper having an oblong bottom, from which the ore is fed, by means of a roller D, in a thin sheet having a width approximately that of the horizontal length of the pole of the magnet. The rear side *d* of the hopper fits closely the surface of the roller, while the front side *e* of the hopper terminates above the center of the roller, leaving a narrow discharging-throat *f* between it and the roller, which opens horizontally, so that the ore will not run out of the hopper unless the roller is turning. The roller projects approximately one-half its diameter beyond the throat *f* and is turned away from the throat, as shown by the arrow, so as to carry the ore over its upper side. This thin and wide stream of ore falls upon an inclined board E, which arrests to a certain extent the movement of the ore and spreads the stream of pulverized material still further. The checking and spreading board E delivers the stream of pulverized material to another checking and spreading board F, inclined in the opposite direction, which latter board delivers the stream of pulverized material to the polar face of the magnet throughout its length, where it adheres in the form of a magnet-brush G. To still further arrest the motion of the material and to reduce somewhat the strength of adherence of the magnetic brush to the polar face, there is secured to the polar face an angle-piece H, of brass, which extends the entire length of the polar face, the pulverized material being delivered so as to strike the top of the horizontal ledge formed by this brass angle-piece.

I is a dividing-board located below the polar face, dividing the magnetic and non-magnetic materials and directing them into different receptacles. The other polar face of the magnet is utilized in the same manner, another set of similar parts being employed to direct a stream of ore against the other polar face.

The stream of ore being fed directly against the magnetic brush, which is attached to the polar face of the magnet, the non-magnetic particles rebound therefrom and fall outside of the partition I, while the magnetic particles adhere to the magnetic brush. The magnetic brush being overloaded, the magnetic material detaches itself therefrom in bunches or clots, which in falling away from the magnet tend to have their trajectory changed by the attraction of the magnet, so that they fall inside of the dividing-board. The magnet having a minimum length between its polar faces produces a concentrated field of force in which the magnetic lines curve abruptly away from the polar faces, as indicated by the dotted lines in Fig. 1, and the magnetic particles in falling away from the brush through this concentrated field tend to follow the lines of force, and hence

are moved inwardly out of a vertical line a sufficient distance to separate them from the falling stream of non-magnetic particles.

What I claim is—

1. A magnetic separator having an oblong bar-magnet wound over the length of the bar and arranged in a horizontal position so as to present a laterally-extended polar face, in combination with means arranged to feed the mixed magnetic and non-magnetic material directly to the polar face of the magnet, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

2. In a magnetic separator, the combination with a bar-magnet having a polar face which is narrow vertically, of means for feeding a stream of mingled magnetic and non-magnetic particles directly to the polar face of the magnet, whereby the non-magnetic particles will rebound and fall away from the polar face in a vertical line, while the magnetic particles in falling away from the polar face will have their trajectory changed in passing through the field of the magnet, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

3. In a magnetic separator, an oblong bar-magnet wound lengthwise of the core and presenting polar faces at the side edges of the core, said magnet being arranged in a horizontal position and having a minimum length between the polar faces so as to present a concentrated field of force, in combination with means for feeding a wide and thin stream of mingled magnetic and non-magnetic particles directly against the polar face of the magnet, whereby the non-magnetic particles will rebound from the magnet and fall in a vertical line, while the magnetic particles in falling away from the magnet will have their trajectory changed in passing through the concentrated magnetic field, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

4. In a magnetic separator, the combination with a bar-magnet having a vertical polar face, of a horizontal non-magnetic projection from such polar face, and means for feeding a mingled stream of magnetic and non-magnetic particles directly to said polar face and upon said horizontal projection whereby the movement of the material will be arrested and the non-magnetic particles will rebound away from the polar face, substantially as set forth.

5. In a magnetic separator, the combination with a bar-magnet having a narrow ledge or shelf of non-magnetic material secured to its polar face, of means for feeding a mingled stream of magnetic and non-magnetic particles directly to said polar face and upon said non-magnetic ledge, substantially as set forth.

6. In a magnetic separator, the combination with a horizontal bar-magnet, of means for feeding a stream of mingled magnetic and non-magnetic particles directly against the polar face of the magnet, means for retarding the movement of the stream before it is delivered to the magnet, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

7. In a magnetic separator, the combination with a horizontal bar-magnet to the polar face of which mingled magnetic and non-magnetic particles are directly fed, of the oppositely-inclined checking and spreading boards over which the stream of particles passes before reaching the magnet, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

8. In a magnetic separator, the combination with a separating-magnet, of a hopper and a feeding-roller relatively arranged so as to produce a horizontally-opening discharge-throat above the roller, whereby a thin stream of mingled magnetic and non-magnetic particles will be delivered by the roller directly to the polar face of said magnet, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

9. In a magnetic separator, the combination with a bar-magnet of oblong form arranged in a horizontal position, of a hopper and a roller delivering the mingled magnetic and non-magnetic material directly to the polar face in a thin and wide stream from the bottom of the hopper, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

10. In a magnetic separator, the combination with a bar-magnet to the polar face of which the material is directly fed, of a hopper having a roller-feed, the oppositely-inclined checking and spreading boards, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

11. In a magnetic separator, the combination with a bar-magnet, of a shelf or ledge of non-magnetic material secured to the polar face of the magnet, and the oppositely-inclined checking and spreading boards over which the stream of mingled magnetic and non-magnetic particles passes and by which such stream is delivered to the polar face of the magnet and upon said non-magnetic shelf, substantially as set forth.

12. In a magnetic separator, the combina-

tion with a bar-magnet, of means for feeding two streams of mingled magnetic and non-magnetic materials directly to the opposite polar faces of said magnet, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

13. In a magnetic separator, an oblong bar-magnet arranged in a horizontal position wound lengthwise over the bar, whose horizontally-extended side edges form the polar faces, such magnet having a minimum length between the polar faces so as to produce a concentrated field of force, in combination with means for feeding two streams of mingled magnetic and non-magnetic material directly against the opposite polar faces of the magnet, whereby the non-magnetic particles will rebound and fall in vertical lines, while the magnetic particles in falling away from the polar faces will have their trajectory changed in passing through the concentrated magnetic field, and means for automatically and separately receiving the magnetic and non-magnetic particles continuously separated by the magnetic action, substantially as set forth.

This specification signed and witnessed this 14th day of May, 1897.

THOMAS A. EDISON.

Witnesses:
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EUGENE COUSAN.